WHAT IS CLAIMED IS:

1. A method of using vaults as carrier molecules to deliver one or more than one substance to an organism, or to a specific tissue or to specific cells, or to an environmental medium, comprising:

a) providing vaults;

b) incorporating the one or more than one substance into the vaults; and

c) administering the vaults comprising the one or more than one substance to the organism, to the specific tissue, to the specific cells, or to the environmental medium.

2. The method of claim 1, where the vaults provided are purified from natural sources.

3. The method of claim 1, where the vaults provided are generated using recombinant technology.

4. The method of claim 1, where incorporation is accomplished by incubating the vaults with the one or more than one substance.

5. The method of claim 1, where the one or more than one substance is selected from the group consisting of an enzyme, a pharmaceutical agent, a plasmid, a polynucleotide, a polypeptide, a sensor and a combination of the preceding.

6. A vault-like particle comprising MVP.

7. The vault-like particle of claim 6, further comprising VPARP or modified VPARP, or a portion of VPARP or a modified portion of VPARP.

8. The vault-like particle of claim 6, further comprising TEP1 or modified TEP1, or a portion of TEP1 or a modified portion of TEP1.

9. A vault-like particle comprising modified MVP.

10. The vault-like particle of claim 9, where the modified MVP comprises an amino acid sequence added to the N-terminal of the MVP which results in one or more than one substance-binding domain within the vault-like particle.

11. The vault-like particle of claim 10, where the one or more than one substance-binding domain is between 1 and 95 substance-binding domains.

12. The vault-like particle of claim 10, where the one or more than one substance-binding domain is 96 substance-binding domains.

13. The vault-like particle of claim 10, where the one or more than one substance-binding domain is greater than 96 substance-binding domains.

14. The vault-like particle of claim 10, where the one or more than one substance-binding domain within the vault-like particle is one or more than one heavy metal binding domain.

15. The vault-like particle of claim 14, where the one or more than one heavy metal binding domain binds a heavy metal selected from the group consisting of cadmium, copper, gold and mercury.

16. The vault-like particle of claim 14, where the peptide added to the N-terminal is a cysteine-rich peptide.

17. The vault-like particle of claim 10, where the one or more than one substance-binding domain within the vault-like particle is one or more than one polynucleotide-binding domain.

18. The vault-like particle of claim 17, where the one or more than one polynucleotide-binding domain is a non-specific polynucleotide-binding peptide.

19. The vault-like particle of claim 17, where the one or more than one polynucleotide-binding domain is a specific polynucleotide-binding peptide.

20. The vault-like particle of claim 9, where the modified MVP comprises an amino acid sequence added to the N-terminal of the MVP creates a sensor in the vault-like particle.

21. The vault-like particle of claim 20, where the sensor is selected from the group consisting of a chemical sensor, an ionic sensor, a microorganism sensor, an optical sensor and a pH sensor.

22. The vault-like particle of claim 20, where the sensor is a green fluorescent protein.

23. The vault-like particle of claim 9, where the modified MVP comprises an amino acid sequence added to the C-terminal of the MVP which results in one or more than one receptor-binding domain.

24. The vault-like particle of claim 23, where the one or more than one receptor-binding domain is between 1 and 95 receptor-binding domains.

25. The vault-like particle of claim 23, where the one or more than one receptor-binding domain is 96 receptor-binding domains.

26. The vault-like particle of claim 23, where the one or more than one receptor-binding domain is greater than 96 receptor-binding domains.

27. The vault-like particle of claim 23, where the one or more than one receptor-

binding domain is non-specific.

28. The vault-like particle of claim 23, where the one or more than one receptor-binding domain is specific.

29. The vault-like particle of claim 10, where the modified MVP further comprises an amino acid sequence added to the C-terminal of the MVP which results in one or more than one receptor-binding domain.

30. The vault-like particle of claim 29, where the one or more than one receptor-binding domain is between 1 and 95 receptor-binding domains.

31. The vault-like particle of claim 29, where the one or more than one receptor-binding domain is 96 receptor-binding domains.

32. The vault-like particle of claim 29, where the one or more than one receptor-binding domain, is greater than 96 receptor-binding domains.

33. The vault-like particle of claim 29, where the one or more than one receptor-binding domain is non-specific.

34. The vault-like particle of claim 29, where the one or more than one receptor-binding domain is specific.

35. The vault-like particle of claim 9, where the modified MVP comprises both an amino acid sequence added to the C-terminal of the MVP and an amino acid sequence added to the N-terminal of the MVP.

36. A vault-like particle comprising MVP or modified MVP, and further comprising VPARP or a portion of VPARP comprising at least about 150 consecutive residues of VPARP.

37. The vault-like particle of claim 36, where the portion of VPARP comprises residues from about residue 1562 to 1724 of human VPARP, SEQ ID NO:3.

38. The vault-like particle of claim 36, where the portion of VPARP comprises residues from about residue 1473 to 1724 of human VPARP, SEQ ID NO:3.

39. The vault-like particle of claim 36, where the VPARP or portion of VPARP is modified.

40. The vault-like particle of claim 39, where the modification comprises adding an amino acid sequence added to the C-terminal of the VPARP or portion of VPARP.

41. The vault-like particle of claim 39, where the modification comprises adding an amino acid sequence added to the N-terminal of the VPARP or portion of VPARP.

42. The vault-like particle of claim 39, where the modification comprises adding an amino acid sequence added to both the C-terminal and the N-terminal of the VPARP or portion of VPARP.

42. The vault-like particle of claim 36, where the modified MVP comprises an amino acid sequence added to the C-terminal of the MVP.

44. The vault-like particle of claim 36, where the modified MVP comprises an amino acid sequence added to the N-terminal of the MVP.

45. The vault-like particle of claim 36, where the modified MVP comprises both a peptide added to the C-terminal and a peptide added to the N-terminal.

46. A method of preventing damage by one or more than one substance to an organism, to a specific tissue, to specific cells, or to an environmental medium, by sequestering the one or more than one substance within a vault-like particle, comprising:

a) providing vault-like particles;

b) administering the vault-like particles to the organism, tissue, cells or environmental medium; and

c) allowing the vault-like particles to sequester the one or more than one substance within the vault-like particles.

47. The method of claim 46, where the one or more than one substance is a heavy metal selected from the group consisting of cadmium, copper, gold and mercury.

48. The method of claim 46, where the one or more than one substance is a toxin selected from the group consisting of arsenate, dioxin, an organochlorine, a pentachlorophenol and a polychlorinated biphenyl.

49. The method of claim 46, where providing the vault-like particles comprises expressing the vault-like particles in a eukaryotic organism.

50. A method of delivering one or more than one substance to an organism, to a specific tissue, to specific cells, or to an environmental medium, comprising:

a) providing vault-like particles comprising the one or more than one substance; and

b) administering the vault-like particles comprising the one or more than one substance to the organism, tissue, cells or environmental medium.

51. The method of claim 50, where the vault-like particles comprise, consist essentially of or consist of a modified MVP in addition to the one or more than one substance.

52. The method of claim 50, where the vault-like particles comprise a modified VPARP or modified portion of VPARP.

53. The method of claim 50, where the vault-like particles comprise both a modified MVP according to the present invention, and a modified VPARP or modified portion of VPARP.

54. The method of claim 50, where the one or more than one substance is selected from the group consisting of an enzyme, a pharmaceutical agent, a plasmid, a polynucleotide, a polypeptide, a sensor and a combination of the preceding.

55. The method of claim 50, where the one or more than one substance is adenosine deaminase.

56. A method of delivering one or more than one sensor to an organism, to a specific tissue, to specific cells, or to an environmental medium, comprising:

a) providing a vault-like particle comprising the one or more than one sensor; and

b) administering the vault-like particle to the organism, specific tissue, specific cells, or environmental medium.

57. The method of claim 56, where the vault-like particles comprise, consist essentially of or consist of a modified MVP, in addition to the one or more than one sensor.

58. The method of claim 56, where the vault-like particles comprise a modified VPARP or modified portion of VPARP.

59. The method of claim 56, where the vault-like particles comprise both a modified MVP, and a modified VPARP or modified portion of VPARP.

60. The method of claim 56, where the sensor is selected from the group consisting of a chemical sensor, a fluorescent sensor, an ionic sensor, a microorganism sensor, an optical sensor, and a pH sensor.

61. A method of detecting a signal from a sensor within an organism, or a specific tissue or specific cells, comprising:

a) delivering one or more than one sensor to an organism, to a specific tissue, to specific cells, or to an environmental medium according to claim 56; and

b) detecting the presence of the sensor.

62. The method of claim 61, where detection is accomplished by fluorometry or by spectrophotometry.

63. A method of making vault-like particles comprising:

a) creating polynucleotide sequences encoding one or more than one polypeptide selected from the group consisting of MVP, modified MVP, VPARP, a portion of VPARP, modified VPARP, a modified portion of VPARP, TEP1, a portion of TEP1, modified TEP1 and a modified portion of TEP1;

b) using the polynucleotide sequences created to generate a bacmid DNA;

c) using the bacmid DNA to generate a baculovirus comprising the sequence; and

d) using the baculovirus to infect insect cells for protein production using an *in situ* assembly system.

64. A method of making vault-like particles comprising one or more than one substance, the method comprising:

a) making vault-like particles according to claim 63; and

b) co-incubated the vault-like particles with the one or more than one substance.

65. The method of claim 64, where the one or more than one substance is selected from the group consisting of enzyme, a pharmaceutical agent, a plasmid, a polynucleotide, a polypeptide, a sensor and a combination of the preceding.

66. The method of claim 64, further comprising purifying the vault-like particles after making the vault-like particles.